Improvements relating to pneumatic vehicle wheel tyres

Patent Number:	GB753963
Publication date:	1956-08-01
Inventor(s):	
Applicant(s):	PIRELLI
Requested Patent:	☑ GB753963
Application	GB19540024631 19540824
Priority Number(s):	ITX753963 19531106
IPC Classification:	
EC Classification:	B60C9/18, B60C1/00B
Equivalents:	☐ BE530899, ☐

Abstract

Description

RESERV J O X

PATENT SPECIFICATION

753,963 Date of Application and filing Complete Specification: August 24, 1954.

Application made in Italy on November 6, 1953.

Complete Specification Published: August 1, 1956.

Indexat acceptance:-Class 144 (2), C 3 B(2:7:9) COMPLETE SPECIFICATION

Improvements relating to Pneumatic Vehicle Wheel Tyres We, PIRELLI SOCIETA PER AZIONI, a Limited Liability Company organised under the laws of Italy, of 94 Viale Abruzzi, Milan, Italy, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to pneumatic vehicle wheel tyres.

In United Kingdom Patent Specifications No 700,435 and No 726,810 a construction of tyre is described ensuring a minimum of wear of the tread for a given total mileage of use of the tyre, the construction being characterised by a certain distribution, as regards the direction in which the threads lie, of the carcass plies on the one hand and the reinforcing plies (breaker strips) between the carcass and the tread on the other.

According to said construction the carcass is composed of superposed plies, the threads of each of which are parallel and disposed in planes which are perpendicular or nearly perpendicular (e g not less than 800) to the mid-circumferential plane of the tyre In the event of said planes being non-perpendicular to the mid-circumferential plane of the tyre, the direction of the threads of adjacent plies is different in the two plies, with the result that the respective directions cross one another at a small angle.

Further according to said construction, the threads of the reinforcing plies, which are approximately coextensive, as regards width, with the tread and are located directly there-beneath, are laid parallel to one another and extend circumferentially of the tyre in directions which are parallel or nearly parallel (i e at a small angle only, e g not exceeding 200) to the midcircumferential plane of the tyre Such small angle is substantially less than the angle (usually about 400) at which the IPice 3 s Od J Prke 4 S 6 d threads of the plies of the hitherto normal tyres lie to the mid-circumferential plane of the tyre 50 According to the present invention, a pneumatic vehicle wheel tyre employing the foregoing construction is characterised in that it incorporates between the tread and the reinforcing plies, and/or between 55 the reinforcing plies and the carcass plies, a shock absorbing layer of rubber having a low tangential modulus of elasticity and preferably a relatively high hysteresis loss coefficient 60 The invention will be further described with reference to the accompanying drawings.

In these drawings:

Figure 1 is a transverse section, largely 65 diagrammatic, through a normal tyre of the type hereinbefore referred to:

Figure 2 is a diagrammatic representation, hereinafter more particularly described, illustrating the basic principle of 70 the present invention; and Figures 3, 4 and 5 are respectively sectional 'views similar to Figure 1, but illustrating three possible constructions embodying the present invention 75 Like reference numerals are applied to like parts in the various Figures.

Referring first to Figure 1, the tyre shown in this Figure comprises as usual a carcass I, a tread 2 carried thereon, a 80 breaker 3 composed of reinforcing plies as hereinbefore referred to, laid with the threads parallel or nearly parallel to the mid-circumferential plane P-P' of the tyre, and bead cores 4, 5 around which the 85 carcass plies, the threads of which are laid in planes, radial to the tyre, which are perpendicular or nearly perpendicular to said plane P-P', are wrapped in the manner shown 90 Such a tyre (Figure 1) is generally satisfactory as regards performance and practical requirements It tends, however, to be marked by the following unfavourable No 24631/54.

753,963 characteristic, namely the tendency to impart to the vehicle body, with an intensity greater than with tyres of other types, the impacts to which the tyre is continuously subjected as it rolls along uneven ground.

On roads not in good condition such impartation of impacts causes jolts and increased noise inside the vehicle, to the considerable annoyance of the passengers.

It has now been found that the insertion over and/or under the breaker 3 of a shock absorbing layer, the thickness dimension or mean thickness dimension (i e in the case of a non-parallel section layer such for example, as the triangular layers employed in thei tyre of Figure 4) of which may be a dimension ranging from 2 mm to 10 mm, of a rubber compound having a low tangential modulus of elasticity G and preferably a relatively high hysteresis loss coefficient K, said layer being located, in the cross-section of the tyre, between the reinforcing plies (breaker 3) and the tread and/or between said plies and the carcass, substantially improves the behaviour of the tyre, particularly with respect to the above-mentioned characteristic' The modulus G represents the coefficient of proportionality between effort and resulting deformation in the formula G = Stan e, when two forces o of equal magnitude and direction are applied respectively along opposite faces of an elementary cube of rubber as shown in Figure 2, said forces producing a deformation (distortion) of the cross-section of the cube such that the remaining opposite faces of the cube are angularly displaced through H' from their normal (rest) position at right angles to the first mentioned faces The modulus G may be considered as being practically constant within sufficiently approximate limits, this being true even for relatively high values of E O, and it may be expressed dimensionally in Kg/cm 2 for the value tan O = 1 (W = 450) Its value most suitable for the purposes of the present invention is preferably less than 5 Kg/cm 2.

If the same elementary cube (Figure 2) be subjected to repeated angular deformations ranging about the equilibrium (rest) position of the cube, so as to reach a maximum deformation of + O (in one direction and 00 in the opposite direction f times per second, the work done on the rubber mass will result in an increase of temperature -of the mass In order to -60 keep the system in movement it is necessary to expend work upon it, the magnitude of which will be proportional to the volume V of the mass under consideration to the number of cycles f of oscillation of the mass per second and to the square of the angular deformation of the mass, in accordance with the formula W = Kf V tan (i.

The coefficient of proportionality (or of hysteresis) K expresses therefore the work 70 expended per unit of volume of the rubber mass at each cycle of oscillation of the mass, and per unit of angular deformation of the mass it may be expressed dimensionally in Joule per cm' per cycle, for 75 the value tan (H) 1 I For the purposes of the present inven tion, the value of the hysteresis coefficient K is preferably above 0 5.

Referring now to Figures 3, 4 and 5, 80 the tyres illustrated in these Figures are identical to the tyre illustrated in Figure 1 except for the incorporation, in accordance with the present invention, of a shock absorbing layer as hereinbefore re 85 ferred to having the above mentioned characteristics.

In the tyre of Figure 3 this layer, which is marked 6, is disposed beneath the breaker 3, between the latter and the plies 90 of the carcass 1.

In the tyre of Figure 4, the shock absorbing layer is in two sections 6 a and 6 b located respectively beneath the marginal portions of the breaker 3 As shown, the 95 sections 6 a, 6 b are of approximately triangular form in cross-section.

In the tyre of Figure 5 the shock absorbing layer 6 is located above the breaker 3, between the latter and the 100 tread 2.

If desired, there may be two shock absorbing layers, located one above the breaker and the other below, in which case the one below may be in two sections 105 as in the tyre of Figure 4.

With regard to the rubber compound which experience has shown to be suitable for the purposes of the present invention, it may be said that compounds having the 110 character of sponge rubber are generally speaking the most suitable As is known, such compounds are obtained by adding to the vulcanisable rubber mix while it is still in the plastic (unvulcanised) con 115 dition, a suitable amount of an ingredient capable of developing gases during the vulcanisation of the mix, by reason of chemical reaction under the

heat In manufacturing the improved tyre of the 120 present invention, in the preferred form thereof according to which the shock absorbing layer or layers are composed of a rubber compound as referred to above having the characteristics of sponge 125 rubber, the formation of said compound is preferably effected in situ in the tyre during the normal vulcanisation of the tyre, the vulcanisable rubber mix which is employed to form said layer or layers in 130 753,963 3 cluding an ingredient capable in the manner described of developing gases in the mass during the vulcanisation thereof with resulting impartation of a spongy texture to the rubber In this way the tangential modulus of elasticity (G) of the vulcanised rubber of the shock absorbing layer or layers may reach a very low value, for instance a value as low as I to 3 Kg/cm 2, heretofore never attained.

The term "threads" in the sense in which the term is used herein and in the appended claims includes any of the conventional forms of single or multistrand textile fibre or metal wire threads as used in the construction of Pneumatic vehicle wheel tyres.

Claims

What we claim is:

1 A pneumatic vehicle wheel tyre incorporating beneath the tread a plurality of reinforcing plies formed of parallel laid threads extending, circumferentially of e tyre, in directions which are parallel or nearly parallel (i e at a small angle only, e g not exceeding 20) to the mid-circumferential plane of the tyre, the carcass plies of the tyre being formed of parallel laid threads disposed in planes which are perpendicular or nearly perpendicular (e g.

not less than 800) to said mid-circumferential plane, characterised in that the tyre further incorporates between the tread and the reinforcing plies and/or between the reinforcing plies and the carcass plies, a shock absorbing layer of rubber having a low tangential modulus of elasticity and preferably a relatively high hysteresis loss coefficient.

2 A tyre as claimed in Claim 1, the shock absorbing layer being located between the reinforcing plies and the carcass plies, wherein said layer is in two sections located below the marginal portions only of the reinforcing plies, said sections being of approximately triangular cross-section.

3 A tyre as claimed in Claim 1 or Claim 2, wherein the thickness dimension or mean thickness dimension of the shock absorbing layer or each shock absorbing layer is a dimension within the range of 50 from 2 mm to 10 mm.

4 A tyre as claimed in any of the preceding claims, wherein the tangential modulus of elasticity of the rubber of which the shock absorbing layer or layers 55 is or are composed is lower than 5 Kg/cm 2 and the hysteresis loss coefficient is higher than 0 5.

A tyre as claimed in any of the preceding claims, wherein the rubber of 60 the shock absorbing layer or layers is of the sponge rubber type produced by adding to the basic composition to form the rubber an ingredient reactive under the heat applied to the composition in the 65 vulcanisation thereof to develop within the mass a gas which produces cavities therein, the resulting spongy rubber having a tangential modulus of elasticity of the order of 1-3 Kg/cm' 70 6 A method of manufacturing a tyre as claimed in Claim 5, characterised in that the spongy rubber is produced in situ in the tyre interior in the course of vulcanisation of the tyre, a vulcanisable 75 rubber mix being employed to form the shock absorbing layer or layers which includes the requisite gas originating ingredient.

7 A pneumatic vehicle wheel tyre 80 constructed substantially as hereinafter described with reference to the accompanying drawings.

G F REDFERN & CO.

Redfern House, Dominion Street, London, E C 2.

Berwick-upon-Tweed: Printed for Her Majesty's Stationery Office, by The Tweeddalc Press -1956.

Published at The Patent Office, 25, Southampton Buildings London, W C 2, from which copies may be obtained.

753,963

FIG. 1.

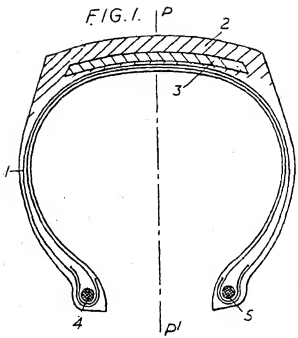


FIG. 3

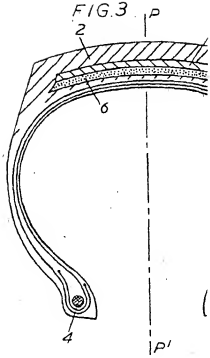


FIG. 2.

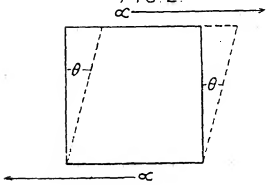
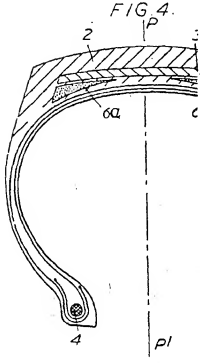


FIG. 4.



753,963 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

FIG.3.

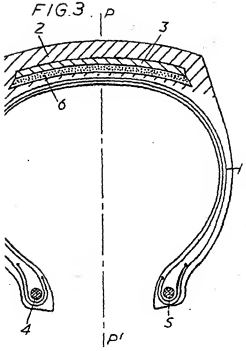


FIG.4.

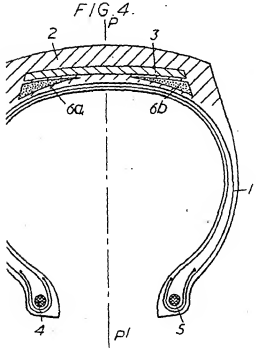
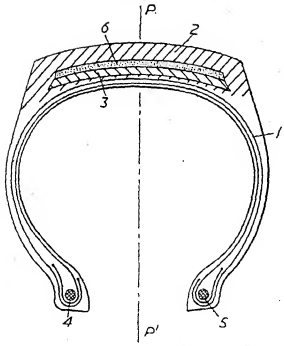


FIG.5.



753,963 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale.

FIG 1.

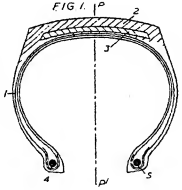


FIG 3

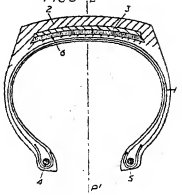


FIG 5.

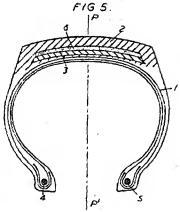


FIG 2

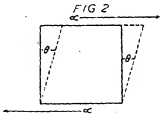


FIG 4